

DESCRIPTIONS OF NEW SPECIES OF FLIES OF
THE FAMILY AGROMYZIDAE FROM ALBERTA, CANADA (DIPTERA)

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Thirteen new species of flies of the family Agromyzidae (Diptera) described in this paper are: *Agromyza albertensis*, *A. masculina*, *Ophiomyia monticola*, *O. pulicarioides*, *Phytobia flavohumeralis*, *Cerodontha occidentalis*, *Liriomyza conspicua*, *L. montana*, *L. cordillerana*, *L. septentrionalis*, *Lemurimyza pallida*, *Phytomyza lupini* and *P. lupinivora*. Necessary amendments to existing keys are given to include the above species.

The description of new species in this paper is a partial report on the survey of Agromyzid flies of Alberta, conducted during the years 1966 and 1967. The holotype and allotype of all new species will be deposited in the Canadian National Collection, Ottawa, Canada.

Since the publication of Frick's (1959) keys for the North American Agromyzid flies, many changes have taken place. Nowakowski (1962) suggested a new grouping of the genera based on genitalic structures. While I agree with Nowakowski's classification, the generic arrangements of Frick's keys have not been changed. The new species have been included in the existing framework of keys by giving the necessary amendments. Mr. K. A. Spencer intends to publish shortly a synopsis of the Canadian Agromyzidae and these new species will be included in his new keys.

As will be evident from the discussion of various species, the characters of the male genitalia have been extremely important in distinguishing between closely related species.

Agromyza albertensis new species

Description

Head (fig. 1). Frons slightly narrower than the width of an eye (1 : 0.9), almost equal in length to its width at level of front ocellus. In profile orbits and frons projecting in front of eye margin particularly above antenna. Lunule lower than a semicircle. Two strong Ors directed

upwards, two strong *Ori* directed inwards; orbital setulae few, about four, reclinate; lower ocellar bristle reaching the base of lower *Ors*. Eyes bare; ocellar triangle small. Gena about one fourth of the eye height midway between vibrissal and posterior margins, not extending in front of eye in profile. Vibrissal hair short and bent inwards. Antennal bases approximate; third antennal segment rounded anteroventrally, covered with uniform pubescence; arista 1.75 times the total length of antenna, pubescent.

Mesonotum. Two small presutural and four postsutural *dc* increasing in length posteriorly; *acr* in about 5-6 irregular rows.

Leg. Mid-tibia without a bristle medially.

Wing (fig. 2). Length about 2.0 mm in ♂ and 2.6 mm in ♀; costa extending to vein R_{4+5} ; costal segments 2-4 in ratio of 1 : 0.36 : 0.31; last segment of M_{3+4} 0.9 times the penultimate segment; r-m crossvein slightly beyond the middle of the discal cell; wing tip between R_{4+5} and M_{1+2} .

Male Genitalia (fig. 3). Hypandrium with pregonites large and flattened; distiphallus elongate and well sclerotized, with a sharp characteristic bend at its base; basiphallus consisting of a pair of broad bent sclerotized strips, relatively short in relation to the long distiphallus. Phallosphore weakly sclerotized; postgonites with a small apical lobe as in other members of the *nigripes-ambigua* group (Griffiths 1963). Ejaculatory apodeme broad and fan shaped, bulb small.

Colour. Frons matt black; ocellar triangle weakly shining; maxillary palpi black; mesonotum and scutellum shining black; wing veins dark brown; calypter with margin and fringe yellow; halteres yellow; abdomen black; legs black.

Material Examined

Holotype ♂ (with genitalia preparation) Canada, Alberta, Banff, 28. vi. 1966. Allotype ♀ same data. Paratypes, 1 ♀ Alberta, Blairmore, 26. vi. 1966; 1 ♂ and 1 ♀ Alberta, Banff, 28. vi. 1966 (K. A. Spencer) and 1 ♂ Alberta, Blairmore, 26. vi. 1966 (K. A. Spencer).

Derivation of the Specific Name

The specific name *albertensis* has been derived from the name of the province of Alberta, Canada.

Comparisons

Agromyza albertensis belongs to the *ambigua* group and is very close to *A. ambigua* Fallén. In Frick's (1959) key to the North American species of *Agromyza* Fallén, *A. ambigua* Fallén and *A. niveipennis* Zetterstedt both key out at couplet 18. Spencer (1965a) synonymized *niveipennis* Zett. with *ambigua* Fallén after examination of Zetterstedt's type series in Lund. The aedeagus of *A. ambigua* Fallén has been illustrated by Spencer (1965a). *A. albertensis* may be included in Frick's (1959) key to *Agromyza* species by amending couplets 17 and 18 as below:

- 17 Gena in height midway between vibrissal and posterior angles about one fourth the eye height 18
 Gena in height midway between vibrissal and posterior angles about

- one seventh the eye height *barberi*
 18 Wings shining milk white (Hendel 1936), aedeagus as figured by
 Spencer (1965a) *ambigua*
 Wings normal. Distiphallus with a characteristic bend at its base,
 relatively longer and narrower *albertensis*

Biology

Not confirmed, but as far as known all species of this group are grass feeders in the larval stage (Griffiths 1963).

Agromyza masculina new species

Description

Head (fig. 4). Frons 1.2 times longer than broad, slightly narrower than the width of the eye (1 : 0.8) at the level of front ocellus, not projecting above the eye in profile. Lunule lower than a semicircle, slightly sunken below the frons. Two strong *O*_{rs} directed upwards; two *O*_{ri} directed inwards and upwards; orbital setulae 6-8, reclinate. Eyes bare; ocellar triangle small. Gena narrow, one eighth of the eye height in its middle, not projecting in front of the eye margin in profile. Vibrissal hair short and bent inwards. Antennal bases approximate; third antennal segment broad with slightly longer pubescence in front; arista long about twice the total length of the antenna.

Mesonotum. Dorsocentrals 3+1, strongly developed; *acr* in about six irregular rows.

Leg. Mid-tibia without a bristle medially.

Wing (fig. 5). Length about 2.5 mm; costa extending to vein M_{1+2} costal segments 2-4 in the ratio of 1 : 0.2 : 0.2; last segment of M_{3+4} 0.79 times the penultimate segment; r-m slightly before the middle of the discal cell; wing tip between R_{4+5} and M_{1+2} .

Male Genitalia (fig. 6). Hypandrium V-shaped, with small pregonites at the anterior end, basal half of the side arm flattened. Distiphallus elongate and well sclerotized; mesophallus with two sclerotized bars, of which the right continues as a narrow strip to join the basiphallus; basiphallus with weakly sclerotized broad strip on one side and a membranous fold on the other. Ejaculatory apodeme fan shaped, bulb small.

Colour. Frons dull greyish black; ocellar triangle weakly shining black; antennae black; maxillary palpi brownish black; mesonotum, scutellum and abdomen weakly shining black; wing veins dark brown; calypter margin and fringe yellowish brown; halteres yellow; legs with femora brownish black, tibiae and tarsi yellowish brown.

Material Examined

Holotype ♂ (with genitalia preparation) Canada, Alberta, Blairmore, 26. vi. 1966. Allotype ♀ same locality, 27. vi. 1966. Paratypes, 1 ♀, Alberta, Okotoks, 10. vi. 1966 (K.A. Spencer).

Derivation of the Specific Name

Agromyza masculina belongs to the *spiraeae* group. The species in this

group are poorly differentiated in external characters but examination of the male genitalia reveals conspicuous differences among the included species. The name *masculina* was suggested by K.A. Spencer in view of the distinctly larger and sclerotized aedeagus when compared to that of *spiraee* Kaltenbach.

Comparisons

Agromyza masculina can be included in Frick's (1959) key to North American *Agromyza* species by amending and extending the couplets 19 and 20 as follows:

- 19 Calypter with margin and fringe brown or yellowish brown 20
 Calypter with margin and fringe white or yellow 21
- 20 Mid-tibia medially with two posterolateral setae *isolata*
 Mid-tibia without posterolateral setae 20a
- 20a Calypter with margin and fringe brown; distiphallus widely separated from basiphallus by a completely membranous section
 *spiraee*
 Calypter with fringe yellowish brown; mesophallus with a pair of sclerites distally; hypandrium with broader arms *masculina*

Ophiomyia monticola new species

Description

Head (fig. 7). Frons slightly narrower than the width of the eye (1 : 0.9) at the level of the front ocellus, projecting conspicuously in front of the eye margin in profile. Two equal, strong *Ors* directed upwards; two *Ori*, weaker than *Ors*, directed inwards and upwards; orbital setulae few, 5-6, reclinate. Eyes 1.3 times longer than broad, bare; ocellar triangle small. Gena about one third of the eye height midway between the vibrissal and posterior margins, projecting in front of the eye margin in profile. Vibrissal hair normal. Facial keel broad and distinctly bulbous below the antennal bases. Antennal bases separate; third antennal segment rounded; arista about one and a half times the total length of the antenna; pubescent.

Mesonotum. Two distinct postsutural *dc*; *acr* numerous, in about ten irregular rows.

Leg. Midtibia without a bristle medially.

Wing (fig. 8). Length about 2.1 mm in ♂ and 2.3 mm in ♀; costa reaching the vein R_{4+5} , costal segments 2-4 in the ratio of 1 : 0.35 : 0.25; last segment of M_{3+4} about three quarters the penultimate; r-m cross vein beyond the middle of the discal cell.

Male Genitalia (fig. 9). Hypandrium with a distinct hypandrial apodeme; aedeagus with a complex distiphallus; basiphallus with two broad sclerotized strips, of which the right is longer and bent at base; phallopore broad and strongly sclerotized; ejaculatory apodeme long, fan shaped with a small gland at the base.

Colour. Completely black species; frons matt black; ocellar triangle weakly shining; mesonotum and scutellum matt black; abdomen weakly shining; wing veins dark brown; calypter with margin and fringe dark

brown; halteres black.

Material Examined

Holotype - ♂ (with genitalia preparation) CANADA, Alberta, Banff, 28. vi. 1966. Allotype - ♀ same data. Paratypes - 2 ♀♀ Alberta, Jasper, 16. vi. 1966; 2 ♂♂ same locality, 18-19. vi. 1966; 1 ♀ Alberta, Cypress Hills, Elkwater, 24. vi. 1966.

Mr. K.A. Spencer has reported the following further specimens which are referable to this species:

CANADA, Alberta, Jasper - 1 ♂, 19. vi. 1966 (K. A. Spencer); Banff, 2 ♂♂, 2 ♀♀, 28. vi. 1966 (K. A. Spencer), 1 ♂, 1 ♀, 8-29. vi. 1922 (C. B. D. Garrett); British Columbia, Atlin - 1 ♀, 14. vii. 1955 (H. J. Huckel), 1 ♂, 13. vi. 1955 (B. A. Gibfarl); 32 miles SW of Terrace - 1 ♀, 11. vi. 1960 (G. E. Shewell); Manitoba - Mile 505, Hudson Bay Railway - 1 ♀, 29. vi. 1952 (J. D. Chillcott); Yukon Territory- FirthRiver, British Mountains - 1 ♂, 1 ♀, 25. vii. 1956 (R. E. Leech). ALASKA - Big Delta - 1 ♂, 10. vi. 1951 (J. R. McGillis), 1 ♀, 27. v. 1951 (W. R. Mason).

Derivation of the Specific Name

The name *monticola* signifies that the species is mountain inhabiting.

Comparisons

Ophiomyia monticola is very close to *O. nasuta* (Melander) (= *Tylomyza nasuta* (Melander) *sensu* Frick 1959) in not having a distinct vibrissal horn in the male, but differs in having only two dorsocentrals and distinct genitalia. *Ophiomyia monticola* may be included in Frick's (1959) key to North American *Ophiomyia* species as given in the extension of couplet 1 at the end of the description below of *Ophiomyia pulicarioides*.

Ophiomyia pulicarioides new species

Description

Head (fig. 10). Frons narrower than the width of an eye (1 : 0.87) at the level of front ocellus, not projecting in front of the eye margin in profile. Lunule lower than a semicircle. Two strong *Ors* directed upwards; two *Ori*, weaker than *Ors*, directed inwards and upwards; orbital setulae about 12-15, reclinate. Eyes 1.2 times longer than broad, bare; ocellar triangle small. Gena about one fifth of the eye height midway between vibrissal and posterior margins, not extending in front of the eye in profile. Vibrissal hair normal. Facial keel narrow. Antennal bases approximate; third antennal segment rounded; arista about twice the total length of the antenna, pubescent.

Mesonotum. Two distinct postsutural *dc*; *acr* numerous, in about ten irregular rows.

Leg. Midtibia without a bristle medially.

Wing (fig. 11). Length about 2.0 mm in ♂ and 2.25 mm in ♀; costa extending to vein M_{1+2} , costal segments 2-4 in the ratio of 1 : 0.26 : 0.24; last segment of M_{3+4} about 0.77 times the penultimate; r-m crossvein beyond the middle of the discal cell.

Male Genitalia (fig. 12). Hypandrium typical V-shaped; aedeagus with a complex distiphallus; basiphallus with two broad sclerotized strips, of which the right is larger than the left; phallopore broad and strongly sclerotized.

Colour. Completely black; frons matt black; ocellar triangle weakly shining; mesonotum, scutellum and abdomen shining black; wing veins dark brown; calypter with margin and fringe dark brown; halteres black.

Material Examined

Holotype - ♂ (with genitalia preparation) CANADA, Alberta, Cypress Hills, Elkwater, 24. vi. 1966; Allotype - ♀ same data.

Derivation of the Specific Name

The name *O. pulicarioides* indicates that this species belongs to the *pulicaria* group.

Comparisons

Ophiomyia pulicarioides resembles *O. pulicaria* (Meigen) in having no vibrissal horn in the male and no distinct facial keel (both sexes); but the male genitalia are distinct. Like *O. pulicaria*, *O. pulicarioides* can easily be confused with the genus *Melanagromyza* Hendel on the basis of external characters alone, but both possess an aedeagus typical of the genus *Ophiomyia* Braschnikov.

Ophiomyia pulicarioides and *O. monticola* described above may be included in Frick's (1959) key to the North American species of *Ophiomyia* by extending couplet 1 as below:

- | | | |
|----|---|------------------------|
| 1 | Haltere black | 1a |
| | Haltere with a white spot on the knob | <i>punctohalterata</i> |
| 1a | Distinct facial keel separating antennae | 1b |
| | Distinct facial keel lacking; male without a vibrissal horn | <i>pulicarioides</i> |
| 1b | Male with a distinct vibrissal horn | 2 |
| | Male without a distinct vibrissal horn; two strong postsutural <i>dc</i> ;
aedeagus as in fig. 9 | <i>monticola</i> |

Phytobia flavohumeralis new species

Description

Head (fig. 13). Frons almost equal to the width of the eye at the level of the front ocellus, slightly projecting in front of the eye margin in profile. Lunule low, reaching slightly above the base of lower *Ori*. Two strong *Ors* directed upwards; two strong *Ori* directed inwards and upwards; orbital setulae about 8-10, reclinate. Eyes about 1.25 times higher than broad; ocellar triangle small. Gena about one eighth of the eye height midway between vibrissal and posterior margins, not extending in front of the eye margin in profile. Vibrissal hair normal. Antennal bases approximate; facial keel narrow; arista long and pubescent.

Mesonotum. Dorsocentrals 3+1; *acr* numerous, in about 10 irregular rows.

Leg. Midtibia with a couple of conspicuous setae medially.

Wing (fig. 14). Length in males 2.8-3.1 mm; costa extending to vein M_{1+2} , costal segments 2-4 in the ratio of 1.0 : 0.30 : 0.24; last segment of M_{3+4} about 0.9 times the penultimate; r-m cross vein approximately at the centre of the discal cell.

Male Genitalia (fig. 15). Hypandrium U-shaped with darkly sclerotized broad arms; aedeagus tubular and lightly sclerotized structure, the distiphallus complex has a swollen bulb at the base, basiphallus consists of a long tube with a distinct curvature; phallopore darkly sclerotized section at the base; ejaculatory apodeme broad and lightly sclerotized, ejaculatory bulb large.

Colour. Frons, orbits and lunule greyish black; gena slightly yellowish; antennae black; maxillary palpi black; mesonotum dull greyish black; humeral areas with a characteristic yellow ring; pleural region dull black; mesepisternum with a narrow yellow band along the upper margin; legs black with a slight yellow at the tip of the femora; wings normal; calypter with margin and fringe dark brown; halteres yellow; abdomen dull greyish black.

Material Examined

Holotype - ♂ (with genitalia preparation) CANADA, Alberta, George Lake, from the Malaise trap collection of Peter Graham of the University of Alberta, Edmonton, 18.v.1967; Paratypes - 10 ♂♂ (all with genitalia preparations), same data, 18-23.v.1967; 7 ♂♂, same data, 11.v.1966; 5 ♂♂, same data, 19-20.v.1966. Mr. Spencer has examined the following:

CANADA, British Columbia, Robson - 1 ♂, 14.v.1947 (H. R. Foxlee); Saskatchewan, Saskatoon - 2 ♂♂, 9.v.1949 (A. R. Brooks); Ontario, Ottawa - 1 ♂, 14.v.1925 (C. H. Curran); Bell's Corner - 2 ♂♂, 25.v.1949 and 21.v.1950 (G. E. Shewell).

Derivation of the Specific Name

The name *flavohumeralis* indicates that the species possesses a characteristic yellow on humeral areas.

Comparisons

Phytobia flavohumeralis is very close to *Phytobia (Phytobia) setosa* (Loew); but differs from it in having a black third antennal segment and a characteristic yellow ring around the humeral areas. It may be included in Frick's (1959) key to the subgenus *Phytobia* Lioy by amending and extending the couplets 6 and 7 as follows:

- 6 Cross vein m-m about its own length from r-m 7
 Cross vein m-m not more than six-tenths of its length from r-m..
 *waltoni*
- 7 Head with one upper-orbital reclinate; dorsal margin of lunule semi-circular (figs. 57 & 58, Frick 1959); mid-tibia with three posterolateral setae *amelanchieris*
 Head with both upper-orbitals reclinate; dorsal margin of lunule flattened; mid-tibia with one or two posterolateral setae 7a
- 7a Mesonotum black; third antennal segment reddish
 Mesonotum with a characteristic yellow ring around humeral areas; third antennal segment black; aedeagus as fig. 15 *flavohumeralis*

This species belongs to the genus *Phytobia* Lioy in the restricted sense proposed by Nowakowski (1962). This group was given subgeneric rank (*Phytobia*, subgenus *Phytobia*) in Frick's (1959) classification.

Cerodontha occidentalis new species*Description*

Head (fig. 16). Frons broad, about 1.1 times the width of the eye at the level of front ocellus; conspicuously projecting in front of the eye margin in profile, less so at the rear. Lunule higher than a semicircle. Two strong *O_{rs}* directed upwards; one *O_{ri}* directed inwards with a small proclinate hair in front; orbital setulae 2-4, the lower two usually proclinate or bent inwards the upper reclinate. Eyes oval about 1.1 times higher than broad; ocellar triangle small. Lower ocellar bristle long extending below the base of the *O_{ri}*. Gena about one-third of the eye height midway between vibrissal and posterior margins. Vibrissal hair strong. Third antennal segment elongate and produced into a sharp spine at the upper angle; arista long and pubescent.

Mesonotum . 3+1 strong dorsocentrals; first two dorsocentrals of almost equal length and strength, third and fourth increase in size posteriorly; *acr* absent.

Leg . Midtibia without a bristle medially.

Wing (fig. 17). Length 2.2-2.5 mm in ♂ and 2.7-2.9 mm in ♀; costa extending to vein M_{1+2} , costal segments 2-4 in the ratio of 1 : 0.2 : 0.2; last segment of M_{3+4} about 0.9 times the penultimate; r-m cross vein slightly before the middle of the discal cell; M_{1+2} at the wing tip.

Male Genitalia (fig. 18a, b). Hypandrium typical U-shaped; aedeagus conspicuously elongate structure; distiphallus with a pair of long sigmoid tubes with a distinct sclerotized bulb at its tip; the apical bulb at the most twice as long as broad; mesophallus is an elongate tubular structure swollen at the base, it has a small recurved process at the distal end and a distinct sclerotized section at its base; hypophallus consists of a pair of recurved processes; basiphallus is a distinct, broad, bent and sclerotized part, its narrow basal end is connected to the distal end of the broad circular and sclerotized phallopore; ejaculatory duct is visible inside the phallopore and basiphallus; ejaculatory bulb broad and has a sclerotized lower wall; ejaculatory apodeme broad, fan shaped and well sclerotized.

Colour . Frons, lunule, facial keel, gena, first and second antennal segments yellow; second antennal segment of antenna sometimes brownish; orbits usually yellow but sometimes slightly darkened along the eye margin in front, in the region of orbital bristles; maxillary palpi and proboscis yellow; mesonotum matt black, humeral callus yellow, with a black spot anteriorly; notopleural areas yellow; scutellum usually matt black sometimes with a light brown central area; mesepisternum and mesepimeron varies from dark brown to black, but always with a yellow band along the upper margins; legs with coxae and femora yellow, tibiae and tarsi brownish yellow to dark brown; wings normal; calypter margin and fringe dark brown; halteres yellow; abdominal terga matt black with a narrow yellow posterior margin.

Material Examined

Holotype - ♂ (with genitalia preparation) CANADA, Alberta, Canmore nr. Banff, 28. vi. 1966, swept on open grass. Paratypes - 20 ♂ (all with

genitalia preparations) and 4 ♀♀, same data; 7 ♂♂ and 2 ♀♀, same data in K.A. Spencer's collection; 1 ♂, Alberta, Blairmore, 27.vi.1966.

Mr. K.A. Spencer has kindly compared the following further specimens referable to this species:

1 ♀ - CANADA, Yukon Territory, Rampart House, 17.vi.1951 (J.E. H. Martin). 1 ♂ - ALASKA, Big Delta, 24.vi.1951 (J.R. McGillis), 1 ♀ - Anchorage, 27.vi.1951 (R.S. Bigelow).

Derivation of the Specific Name

The name *occidentalis* indicates that the species is described from western Canada.

Comparison

Cerodontha occidentalis is very close in its external characters to the only other Nearctic species, *C. dorsalis* (Loew), which has been widely reported from United States and Canada (Frick 1959). This new species like *C. dorsalis* (Loew) shows some colour variation. This colour variation however does not affect the uniformity in the structure of the male genitalia. A detailed examination of a long series of specimens collected mainly at Canmore near Banff, Alberta, shows conspicuous differences from those of typical *C. dorsalis* (Loew). The aedeagus of a typical *C. dorsalis* from the United States (Indiana, Lafayette) collected by J.M. Aldrich is illustrated (fig. 18c) for comparison with that of *C. occidentalis* (figs. 18a, b). The aedeagus in *C. occidentalis* is about one and a half times as long as in *C. dorsalis*. The main distinguishing features are the broader hypophallus, the incurved process at the distal end of the mesophallus, the longer tubes of the distiphallus and comparatively shorter bulb at the tip of the distiphallus.

Other specimens of *C. dorsalis* examined are: Manitoba, Aweme - 1 ♂, 27.viii.1917 (N. Criddle); Alberta, Banff - 1 ♂, 3.ix.1966; Blairmore - 2 ♂♂, 4.ix.1966; Crowsnest - 1 ♂, 5.ix.1966; Medicine Hat - 1 ♀, 16.vi.1928 (F.S. Carr) det. C.H. Curran; British Columbia, Crowsnest - 1 ♂, 26.vii.1926 (A.A. Dennys); Shuswap Lake - 1 ♂, 22.vii.1926 (J.M. Dunnough); Chilliwack - 1 ♂, 14.x.1938 (J.K. Jacob).

Cerodontha occidentalis may be separated from the only other species *Cerodontha dorsalis* (Loew) known in the Nearctic region, by the following key:

- 1 Scutellum adjoining mesonotum usually with a variable yellow spot; the sigmoid tubes of the distiphallus comparatively short with an elongate apical bulb; the latter at least three times as long as broad (fig. 18c) *dorsalis*
 Scutellum and adjoining mesonotum usually with a uniform matt black; the sigmoid tubes of the distiphallus long with a short bulb at the tip; the apical bulb of the distiphallus at the most twice as long as broad (fig. 18a, b) *occidentalis*

Nowakowski (1962) has proposed an enlarged concept of the genus *Cerodontha* Rondani, including a number of subgenera which were transferred from *Phytobia* Lioy. The above new species *Cerodontha occidentalis* like *C. dorsalis* (Loew) belongs to the genus *Cerodontha* in the restricted sense (subgenus *Cerodontha* in Nowakowski's classification).

Liriomyza conspicua new species*Description*

Head (fig. 19). Frons narrower than the width of the eye at the level of front ocellus, projecting conspicuously in front of the eye margin in profile. Lunule reaching up to the base of second *Ori*. Two strong *Ors* directed upwards; three *Ori* in male, the two females referable to this species have four *Ori* on one side, all directed inwards and upwards; orbital setulae about 13-18, reclinate. Eyes oval, 1.3 times higher than broad in profile; ocellar triangle small. Gena high about one fourth the eye height midway between vibrissal and posterior margins, not extending in front of eye margin in profile. Vibrissal hair normal. Facial keel narrow. Antennal bases approximate; third antennal segment broad; pubescent.

Mesonotum (fig. 24). Dorsocentrals 3+4; *acr* in about 5 irregular rows.

Leg. Midtibia without a bristle medially.

Wing (fig. 20). Length 2.5 mm in ♂ and 3.0-3.25 mm in ♀; costa extending to vein M_{1+2} , costal segments 2-4 in the ratio of 1 : 0.3 : 0.2; last segment of M_{3+4} about 1.5 times the penultimate; r-m cross vein approximately at the centre of the discal cell.

Male Genitalia (fig. 22). Hypandrium typical U-shaped with broad pregonites. Aedeagus complex; distiphallus consisting of two long narrow processes joined at the base by a thin membrane; mesophallus a long darkly sclerotized spindle shaped structure; hypophallus complex, partly fused with the basiphallus; the two arms of basiphallus are fused at the base, a short sclerotized segment is connected to one side of basiphallus by a thin membrane. Phallopore well sclerotized and continuous with the basiphallus. Aedeagal rod broad at its anterior end. Ejaculatory apodeme broad and fan shaped; ejaculatory bulb large with thin walls.

Colour. Frons, orbits and antennae yellow; ocellar triangle dark brown; gena yellow; black of occiput touching upper posterior margin of the eye; *vte* and *vti* on the margin of dark brown and yellow grounds; maxillary palpi yellow; mesonotum (fig. 24) brownish black with a characteristic yellow before the scutellum; humeral and notopleural areas yellow; humeral areas with a small brown spot anteriorly; scutellum yellow with very small brown areas near its basal corners; mesepisternum dark brown with upper one third yellow; mesepimeron black with a yellow upper margin; legs with coxae distally yellow; femora yellow; tibiae and tarsi brown; wings normal; calypter with margin and fringe dark brown; halteres yellow; abdominal tergites dark brown with a yellow line along posterior margins.

Material Examined

Holotype - ♂ (with genitalia preparation) CANADA, Manitoba, 5 miles S. W. Shilo, Floodplain community nr. Tamarack Bog, open grassy marsh, 2. viii. 1958, coll. J. G. Chillcott. Paratypes - 1 ♀, Saskatchewan, Butland, 19. vii. 1940, coll. A. R. Brooks; 1 ♀ - Alberta, Jasper, 16. vi. 1966.

Mr. K. A. Spencer has kindly compared the following further speci-

mens also referable to this species:

Manitoba, Minnedosa - 1 ♂, 7.vi.1926 (R.M. White); 9 miles N of Forrest - 1 ♂ and 3 ♀, 29.vi. and 19.vii.1958 (R.B. Madge and R.L. Hurley), 5 miles SW of Shilo, 2 ♀, 5.vi. and 16.vi.1958 (R.L. Hurley). Ontario, Ottawa - 1 ♀, 3.vi.1958. Saskatchewan, Saskatoon - 2 ♂, 3 ♀, 9.v.1949 (A.R. Brooks), 1 ♀, 28.vii.1923 (N.L. Atkinson), 1 ♀, 28.vi.1941 (Arnason); Indian Head - 1 ♂, 3.viii.1939 (C.R. Douglas); Assiniboia - 1 ♀, 27.vi.1955 (J.R. Vockeroth).

Derivation of the Specific Name

The name *conspicua* indicates that this species is very conspicuous in having very bright colouration and characteristic genitalia.

Comparisons

Liriomyza conspicua belongs to the group of species having a characteristic prescutellar yellow. It can be included in Frick's (1959) key to North American *Liriomyza* species by amending and extending the couplet 15 as below:

- 15 Acrostichal setae in 4-5 rows; prescutellar yellow area subrectangular 15a
 Acrostichals five or six in number, in two rows; yellow area triangular *assimilis*
 15a Acrostichals about 13 in number, in four rows; all four dorsocentral setae on yellow ground (Frick 1959) *flavonigra*
 Acrostichals many in about five irregular rows (fig. 21); all four dorsocentral setae on dark brown ground; aedeagus as illustrated (fig. 22) *conspicua*

Liriomyza montana new species

Description

Head (fig. 23). Frons slightly wider than the width of the eye at the level of front ocellus, slightly projecting in front of the eye margin in profile. Lunule low, reaching to the base of the lower *Ori*. Two *Ors* directed upwards; two to three *Ori* directed inwards and upwards; orbital setulae 4-6, reclinate. Eyes about 1.3 times higher than broad; ocellar triangle small. Gena about one fifth of the eye height midway between vibrissal and posterior margins, not extending in front of the eye margin in profile. Vibrissal hair normal. Facial keel narrow; antennal bases approximate; third antennal segment rounded; arista long; weakly pubescent.

Mesonotum. Dorsocentrals 3+1; *acr* numerous in about 4 irregular rows; humeral callus with 4-5 hairs.

Leg. Midtibia without a bristle medially.

Wing (fig. 24). Length 1.9-2.0 mm in ♂; and 2.0-2.25 mm in ♀; costa extending strongly to the vein M_{1+2} ; costal segments 2-4 in the ratio of 1 : 0.3 : 0.24; last segment of M_{3+4} about twice as long as the penultimate; r-m crossvein almost at the centre of the discal cell, sometimes slightly before it; vein M_{1+2} ending at the wing tip.

Male Genitalia (fig. 25). Hypandrium typical U-shaped; pregonites broad; distiphallus elongate with a characteristic bend and sclerotization at its base and has a distinctive small bulb at its tip; basiphallus consisting of two long and narrow sclerites enclosing characteristic sclerotized and swollen ejaculatory duct; hypophallus almost membranous fold; phallopore long and well sclerotized; ejaculatory apodeme fan shaped with a sclerotized bulb at its base.

Colour. Frons, lunule, orbits and gena entirely yellow; third antennal segment yellow, arista brown; black of occiput touching the upper posterior margin of the eye; *vte.* usually on dark brown ground; *vti* on the margin of dark brown and yellow ground; mesonotum shining black with yellow humeral and notopleural areas; humeral area with a small dark spot, humeral seta on yellow ground; scutellum with very small dark area on the basal corners; mesepisternum with upper two thirds yellow and lower one third dark brown; mesepimeron dark brown with a dorsal band of yellow; legs with coxae yellow but have slight brown bases; femora primarily yellow; tibiae and tarsi brown; wings normal; calypter margin and fringe brown; halteres yellow; abdomen shining black.

Material Examined

Holotype - ♂ (with genitalia preparation) CANADA, Alberta, Jasper; 17.vi.1966. Allotype - ♀, same data. Paratypes - 14 ♂ and 5 ♀, same locality, 17-19.vi.1966; 3 ♂, Alberta, Banff, 28.vi.1966. All specimens swept on open grass.

Derivation of the Specific Name

The name *montana* indicates that the species is mountain inhabiting.

Comparison

Liriomyza montana belongs to the *flaveola* group of species on the basis of the male genitalic structures and is very close to European species *L. pedestris* Hendel, but has very distinct genitalia. It is also very close to *L. graminicola* de Meij, in external characters but the male genitalia is very distinct in the shape of the distiphallus.

L. montana resembles *L. richteri* Hering in the general shape of male genitalia, but differs in having yellow femora.

L. montana resembles *L. eupatori* (Kaltenbach) in having yellow femora and four rows of acrostichals but has male genitalia typical of the *flaveola* group. *L. montana* can be included in Frick's (1959) key to the *Liriomyza* species by extending the couplet 29 as below:

- 29 Crossvein m-m not more than its length from r-m; ultimate section M₃₊₄ about three times as long as the penultimate 30
 Crossvein m-m more than its own length from r-m; ultimate section of M₃₊₄ about two times as long as the penultimate 29a
 29a Crossvein m-m 1.5 to two times its length from r-m; humeral callus with 4-9 hairs (Hendel 1936) *eupatori*
 Crossvein m-m slightly less than 1.5 times its length from r-m; humeral callus with 4-5 hairs; male genitalia as illustrated (fig. 25) *montana*

Liriomyza cordillerana new species

Description

Head (fig. 26). Frons almost equal to the width of the eye at the level of front ocellus, slightly projecting in front of the eye margin in profile. Lunule low, reaching to the base of lower *Ori*. Two strong *Ors* directed upwards; usually two *Ori*, of which (but one female has lower *Ori* missing on one side) the lower one slightly weaker than the upper; both *Ori* directed upwards and inwards; orbital setulae about 5-6, reclinate. Eyes about 1.3 times higher than broad; ocellar triangle small. Gena about one fifth of the eye height midway between vibrissal and posterior margins, not extending in front of the eye margin in profile. Vibrissal hair normal. Facial keel narrow. Antennal bases approximate; third antennal segment slightly elongate; arista long and weakly pubescent.

Mesonotum. Dorsocentrals 3+1; *acr* numerous in about 4-5 irregular rows.

Leg. Midtibia without a bristle medially.

Wing (fig. 27). Length 2.4-2.8 mm in ♂ and 2.5-3.0 mm in ♀; costa extending to vein M_{1+2} , costal segments 2-4 in the ratio of 1 : 0.2 : 0.2; last segment of M_{3+4} about twice as long as the penultimate; r-m cross-vein approximately at the centre of the discal cell.

Male Genitalia (fig. 28). Hypandrium typical U-shaped with broad pregonites; postgonites characteristically elongate; distiphallus with a characteristic bend at its base and a darkly sclerotized bulb at its apex, within which two strongly sclerotized ducts can be seen; basiphallus consisting of two long narrow sclerites enclosing the sclerotized ejaculatory duct which does not form a swollen bulb before entering the distiphallus; hypophallus consisting of long narrow and bent sclerites; phallopore broad and strongly sclerotized. Ejaculatory apodeme fan shaped with a strongly sclerotized bulb at its base; ejaculatory duct also sclerotized for a short distance.

Colour. Frons usually yellow but sometimes orange or brownish yellow; ocellar triangle shining black; antennae yellow, with the third segment usually darkened distally; black of occiput touching the upper posterior margin of the eye; *vte* on black ground; *vti* usually on the margin of black and yellow; orbits usually darkened along the eye margin; maxillary palpi yellow; mesonotum shining black with yellow humeral and notopleural areas; both humeral and notopleural areas with a black spot; scutellum yellow with dark areas near its basal corners; pleural areas mainly black; mesepisternum with a narrow yellow upper margin; legs with coxae black; femora black with a yellow distal tip; tibiae and tarsi black; wings normal; halteres yellow.

Material Examined

Holotype - ♂ (with genitalia preparation) CANADA, Alberta, Banff, 3.ix.1966. Allotype - ♀, same data. Paratypes - 9 ♂ and 7 ♀, same data; 3 ♂, Alberta, Jasper, 1.ix.1966; 1 ♂, Alberta, Jasper, Sunwapta Falls, 2.ix.1966; 2 ♂ and 2 ♀, Alberta, Blairmore, 26-27.vi.1966; 2 ♂, same locality, 4.ix.1966; 1 ♂, Alberta, Crowsnest, 5.ix.1966; 13

♂ and 5 ♀, Alberta, Waterton Park, 6-7.ix.1966.

Derivation of the Specific Name

The name *cordillerana* indicates that the species is mainly distributed in the Rockies.

Comparisons

Liriomyza cordillerana belongs to the *flaveola* group of species and is very close to *Liriomyza pedestris* Hendel and *L. richteri* Hering in external appearance but has very distinct genitalia. The male genitalia of *L. richteri* Hering was illustrated by Griffiths (1964), and of *L. pedestris* Hd. by Spencer (1965b).

Liriomyza cordillerana is also very close to *L. septentrionalis*, the new species described below, and can be reliably separated only by detailed examination of the characteristics of its male genitalia. *L. cordillerana* can be included in Frick's (1959) key to North American *Liriomyza* species as shown below at the end of the description of *L. septentrionalis*.

Liriomyza septentrionalis new species

Description

Head (fig. 29). Frons narrower than the width of an eye (1 : 0.8) at the level of front ocellus, not projecting in front of the eye margin in profile. Lunule low, reaching to the base of lower *Ori*. Two strong *Ors*, directed upwards; two slightly weaker *Ori* (three in one specimen), directed inwards and upwards; orbital setulae about 5-8, reclinate. Eyes about 1.2 times longer than broad; ocellar triangle small. Gena about one fifth of the eye height midway between vibrissal and posterior margins, not extending in front of the eye margin in profile. Vibrissal hair normal. Facial keel narrow. Antennal bases approximate; third antennal segment oval; arista long and weakly pubescent.

Mesonotum. Dorsocentrals 3+1; *acr* in about 5 irregular rows.

Leg. Midtibia without a bristle medially.

Wing (fig. 30). Length about 2.5 mm in ♂ and 2.7 mm in ♀; costa extending to vein M_{1+2} , costal segments 2-4 in the ratio of 1 : 0.24 : 0.20; last segment of M_{3+4} about 1.7 times the penultimate; r-m crossvein at the middle of the discal cell.

Male Genitalia (fig. 31). Hypandrium typical U-shaped; pregonites broad; postgonites characteristically elongate; distiphallus with a characteristic bend at the base and weakly sclerotized bulb at its apex, within which a long narrow and weakly sclerotized duct can be seen; basiphallus consisting of two long narrow sclerites enclosing the strongly sclerotized ejaculatory duct which forms a characteristic swollen bulb towards the apex of basiphallus; hypophallus consisting of a pair of short bent sclerites. Ejaculatory apodeme fan shaped; ejaculatory bulb large with strongly sclerotized walls.

Colour. Frons yellow; ocellar triangle dull black; antennae yellow, sometimes third antennal segment slightly orange or brownish; orbits yellow, but may be very slightly darkened; black of occiput touching the

upper posterior margin of the eye; *vte* on black and *vti* on the margin of black and yellow; maxillary palpi brownish yellow; mesonotum shining black with yellow humeral and notopleural areas; both humeral and notopleural areas with a black spot; scutellum yellow, with a black margin near the upper scutellars; pleural areas mainly black; mesepisternum with a narrow yellow upper margin; legs with coxae black; femora black but with a distal yellow; tibiae and tarsi black; wings normal; calypter margin and fringe black; halteres yellow; abdomen black.

Material Examined

Holotype - ♂ (with genitalia preparation) CANADA, Alberta, Banff, 28.vi.1966. Allotype - ♀ same data. Paratypes - 1 ♀, same data; 1 ♂ and 1 ♀, Alberta, Jasper, 17-18.vi.1966; 2 ♂, Alberta, Blairmore, 26.vi.1966; 3 ♂, Alberta, Waterton National Park; 6-7.ix.1966.

Mr. K.A. Spencer has kindly examined the following specimens referable to this species:

CANADA, Alberta, Frank - 1 ♀, 13.vii.1966 ex mine in grass leg. 26.vi.1966 (K.A. Spencer); Jasper - 1 ♂, 25.vii.1926 (J. McDunnough); Banff - 1 ♀, 7.vii.1955 (J.R. Cogles); Elkwater - 1 ♀, 2.vi.1955 (J.R. Vockeroth); British Columbia, Cultus Lake - 2 ♂, 4-10.vii.1948 (H.R. Foxlee); Brilliant - 1 ♀, viii.1947 (H.R. Foxlee).

Derivation of the Specific Name

The name *septentrionalis* indicates that the species is northern in its distribution.

Comparisons

Liriomyza septentrionalis belongs to the *flaveola* group and is very close to *L. flaveola* (Fallén) but has a darker mesepisternum and a distinct aedeagus. It is also very close to European species *L. pedestris* Hendel externally, but has a distinct genitalia. The genitalia of *L. flaveola* (Fallén) and *L. pedestris* Hendel have been illustrated by Spencer (1965a, 1965b).

Liriomyza septentrionalis is also very close to *L. cordillerana*, the species described above, from which it can be reliably differentiated only by a close examination of aedeagus, which has characteristically swollen ejaculatory duct between basiphallus and distiphallus, and a paler distiphallus. It also differs in having usually yellow orbits and third antennal segment.

Liriomyza septentrionalis and *L. cordillerana* can be included in Frick's (1959) key to North American *Liriomyza* species by amending and extending the couplet 23 as below:

- 23 Femora primarily yellow, usually marked with brown or black streaks or spots 24
 Femora black, distal one third yellow 23a
- 23a Mesepisternum with at least dorsal one third yellow 23b
 Mesepisternum approximately with upper half yellow (Frick 1959); aedeagus as illustrated by Spencer (1965a) *flaveola*
- 23b Orbits usually yellow; aedeagus with ejaculatory duct characteristically swollen between basiphallus and distiphallus (fig. 31) distiphallus lightly sclerotized and as illustrated (fig. 31) *septentrionalis*

Orbits usually darkened; ejaculatory duct between basiphallus and distiphallus not swollen, distiphallus darkly sclerotized and as illustrated (fig. 28)*cordillerana*

Lemurimyza pallida new species

Description

Head (fig. 32). Frons almost equal to the width of the eye; slightly projecting in front of the eye margin in profile, particularly so at the base of the antenna. Two strong *Ors* directed upwards; one *Ori* directed inwards; orbital setulae about 8-9. Eyes oval, 1.2 times higher than broad; ocellar triangle small. Gena about one third (1 : 0.3) of the eye height midway between vibrissal and posterior margins, not extending in front of the eye in profile. Antennal bases approximate; third antennal segment elongate; arista long and covered with uniform pubescence.

Mesonotum . Dorsocentrals 3+1; *acr* in two rows.

Wing (fig. 33). Length in ♂ 2.1 mm; costa extending to vein M_{1+2} ; costal segments 2-4 in the ratio of 1 : 0.26 : 0.21; last section of M_{3+4} about twice as long as the penultimate; r-m crossvein almost at the centre of the discal cell; wing tip at M_{1+2} .

Male Genitalia (fig. 34). Hypandrium typically U-shaped with narrow side arms and broad fused pregonites. Distiphallus with the characteristic paired tubules bent outwards; mesophallus long and cylindrical, darkly sclerotized; hypophallus consists of sclerotized narrow ventral appendages at the base of mesophallus. Surstyli with sclerotized teeth on their ventral surface. Ejaculatory apodeme broad and fan shaped; ejaculatory bulb large and membranous.

Colour . Frons, orbits, genae and antennae entirely yellow; arista brownish; ocellar triangle brown. Mesonotum matt black; humeral and notopleural areas yellow with a small black spot on both. Legs with femora and tibiae yellow; tarsi brownish. Wings normal; calypter margin and fringe brown; halteres yellow.

Material Examined

Holotype - ♂ (with genitalia preparation) CANADA, Alberta, Banff, 28. vi. 1966.

Derivation of the Specific Name

The name *pallida* indicates that the species is mostly yellow in colour.

Comparisons

The genus *Lemurimyza* was described by Spencer (1965) and includes four world species. *Lemurimyza pallida* represents the first record of the genus in the Nearctic region. This species is characteristic in having a yellow third antennal segment and characteristic male genitalia.

Phytomyza lupini new species*Description*

Head (fig. 35). Frons almost equal to the width of the eye at the level of the front ocellus, conspicuously projecting in front of the eye margin in profile. One *Ors* directed upwards; two *Ori* directed inwards; orbital setulae many, proclinate. Eyes almost circular; ocellar triangle small. Orbits prominently projecting in front and below the eye margin. Gena about one third (1 : 0.33) of the eye height midway between the vibrissal and posterior margins, becoming higher posteriorly. Antennal bases approximate; third antennal segment elongate; arista long and swollen at the base, weakly pubescent.

Mesonotum . Dorsocentrals 3+1; *acr* in 2-3 irregular rows.

Wing (fig. 36). Length 2.6 mm in ♂, 2.8 mm in ♀, costa extending strongly to vein R_{4+5} ; costal segments 2-4 in the ratio of 1 : 0.24 : 0.4; wing tip at the vein M_{1+2} .

Male Genitalia (fig. 37). Hypandrium V-shaped with broad side arms and flattened pregonites; aedeagus complex; distiphallus with a characteristic bent section which has a sclerotized tip; basiphallus consisting of two broad sclerotized arms joined at the base which are produced into broad sclerotized plates distally; phallopore broad and continuous with the basiphallus; aedeagal apodeme very broad; ejaculatory apodeme fan shaped with a slightly sclerotized bulb.

Colour . Frons dominantly yellow or slightly brownish at the base; orbits yellow; black of the occiput touching the posterodorsal margin of the eye; *vte* on black ground and *vti* on the margin of yellow and black ground; ocellar triangle weakly shining black; third antennal segment shining black; first and second segments yellowish black. Mesonotum and scutellum matt black; pleura matt black. Legs: femora with a distal ring of yellow; tibiae and tarsi black. Wings normal; calypter margin and fringe yellowish brown; halteres yellow. Abdomen black.

Material Examined

Holotype - ♂ (with genitalia preparation) CANADA, Alberta, Blairmore, ex stem mines on *Lupinus sericeus* Pursh (Leguminosae) collected 6. ix. 1966, emerged 11. iii. 1967; puparium chilled at 45 F for 12 weeks; Allotype - ♀, same data, emerged 20. iii. 1967; Paratypes - 1 ♂ and 3 ♀, same data.

Mr. K.A. Spencer has kindly examined the following specimens which are referable to this species:

CANADA, British Columbia, Albion - 2 ♂, 7. viii. 1952, ex "crown of *Lupinus* sp." (Y. Ayre).

Derivation of the Specific Name

Phytomyza lupini is named after its larval food plant *Lupinus sericeus* Pursh (Leguminosae).

Comparisons

Phytomyza lupini may be included in Frick's (1957) key to the genus *Phytomyza* Fallén by amending and extending the couplet 17 as below:

- 17 Genovertical plates darkened *angelicella*
 Genovertical plates yellow 17a
 17a Acrostichals in 4-5 rows (Frick 1957); intraalar row with 10-12
 setulae anterior to and 13-15 posterior to the transverse suture ..
 *aquilegiana*
 Acrostichals in 2-3 irregular rows; intraalar row with about 3 set-
 ulae anterior to and 2-3 posterior to the transverse suture; male
 genitalia as illustrated (fig. 37) *lupini*

Biology

The larvae bore inside the stems of *Lupinus sericeus* Pursh (Leguminosae). Pupation takes place inside the stem. The puparia are characteristic in having a distinct horn on the posterior spiracles.

Phytomyza lupinivora new species

Description

Head (fig. 38). Frons narrower than the width of the eye (1 : 0.84) at the level of the front ocellus, not projecting in front of the eye margin in profile. Two strong *Ors* directed upwards; two slightly weaker *Ori* directed inwards; orbital setulae few, about 4, proclinate. Eyes rounded; ocellar triangle small. Gena about two fifths (1 : 0.4) of the eye height midway between the vibrissal and posterior margins, not extending in front of the eye in profile. Antennal bases approximate; third antennal segment rounded; arista small and thickened at the base; weakly pubescent.

Mesonotum. Dorsocentrals 3+1; two small *acr* present between first and second pair of dorsocentrals.

Wing (fig. 39). Length in ♀ 1.75 mm; costa extending strongly to vein R_{4+5} ; costal segments 2-4 in the ratio of 1 : 0.24 : 0.75; wing tip at M_{1+2} . The wing of the ♀ holotype is abnormal in having an additional vein near the tip of R_{2+3} .

Colour. Completely black species; frons dull black; ocellar triangle weakly shining; gena, orbits and antennae matt black; mesonotum and scutellum matt black; pleura weakly shining black; legs black; wing veins dark brown; calypter margin and fringe dark brown; halteres yellow; abdomen matt black.

Material Examined

Holotype - ♀ CANADA, Alberta, Blairmore, ex leaf mines on *Lupinus sericeus* Pursh (Leguminosae), collected 6.ix.1966, emerged 20.ii.1967; puparium chilled at 45 F for 8 weeks.

Derivation of the Specific Name

Phytomyza lupinivora is named after its larval food plant, *Lupinus sericeus* Pursh (Leguminosae).

Comparisons

Phytomyza lupinivora is very unusual in having a very short second costal

segment and a rather long fourth segment. It can be included in Frick's (1957) key to North American species of the genus *Phytomyza* Fallén by extending the couplet 30 as below:

- 30 Antenna dark brown or black; tarsi and tibiae black, brown or dark reddish brown 30a
 Antenna with first, second, and basal portion of third reddish yellow; tarsi and distal portion of tibiae yellow *agromyzina*
- 30a Acrostichals in 2-8 rows 31
 Acrostichals very few (about two); wings with costal segments 2-4 in the ratio of 1 : 0.24 : 0.75 *lupinivora*

Biology

Larvae feed inside the linear mines in the leaflets of *Lupinus sericeus* Pursh (Leguminosae). Mines are for the most part upper surface, irregular and partly lower surface. The pupation takes place outside the mine.

ACKNOWLEDGEMENTS

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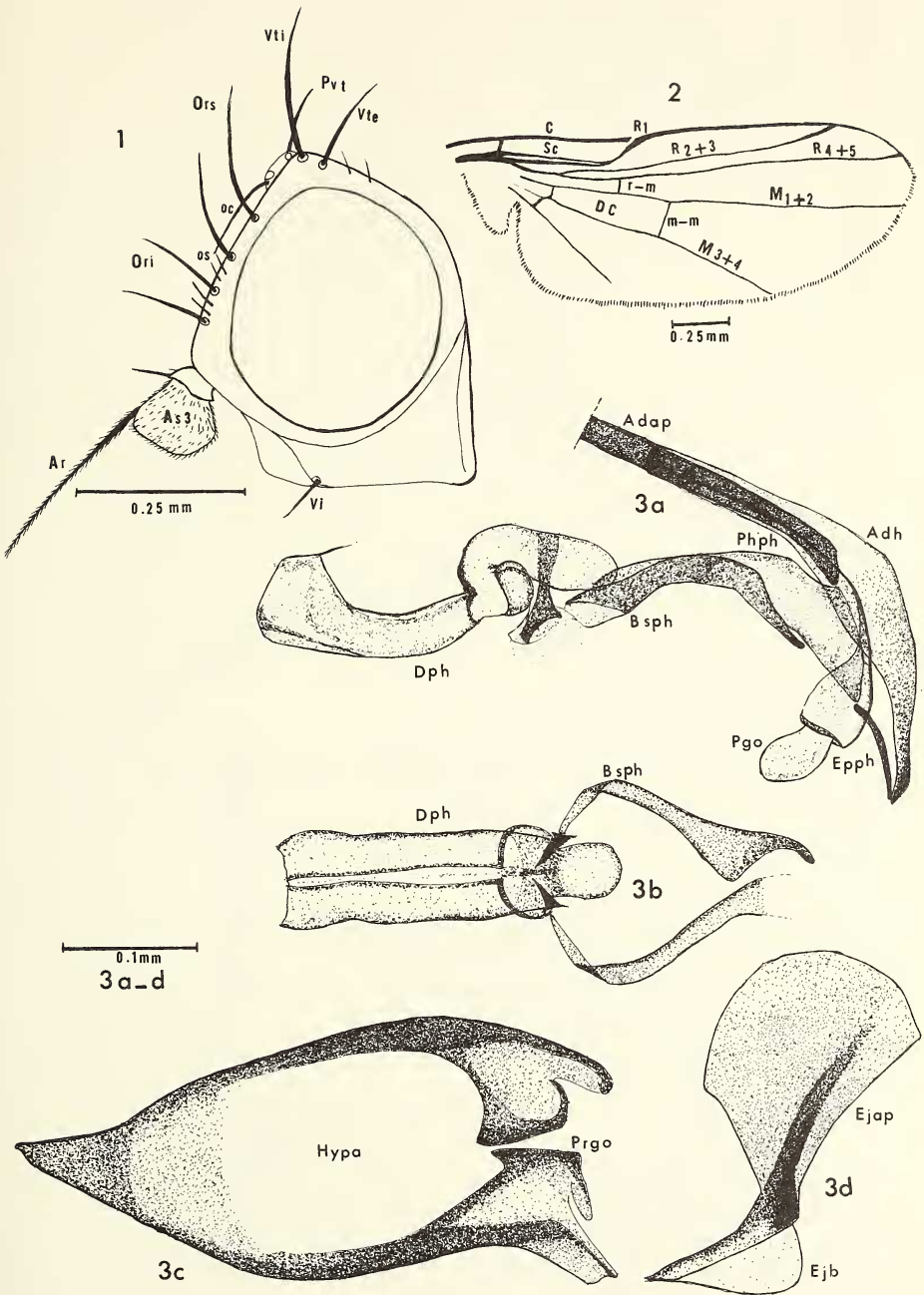
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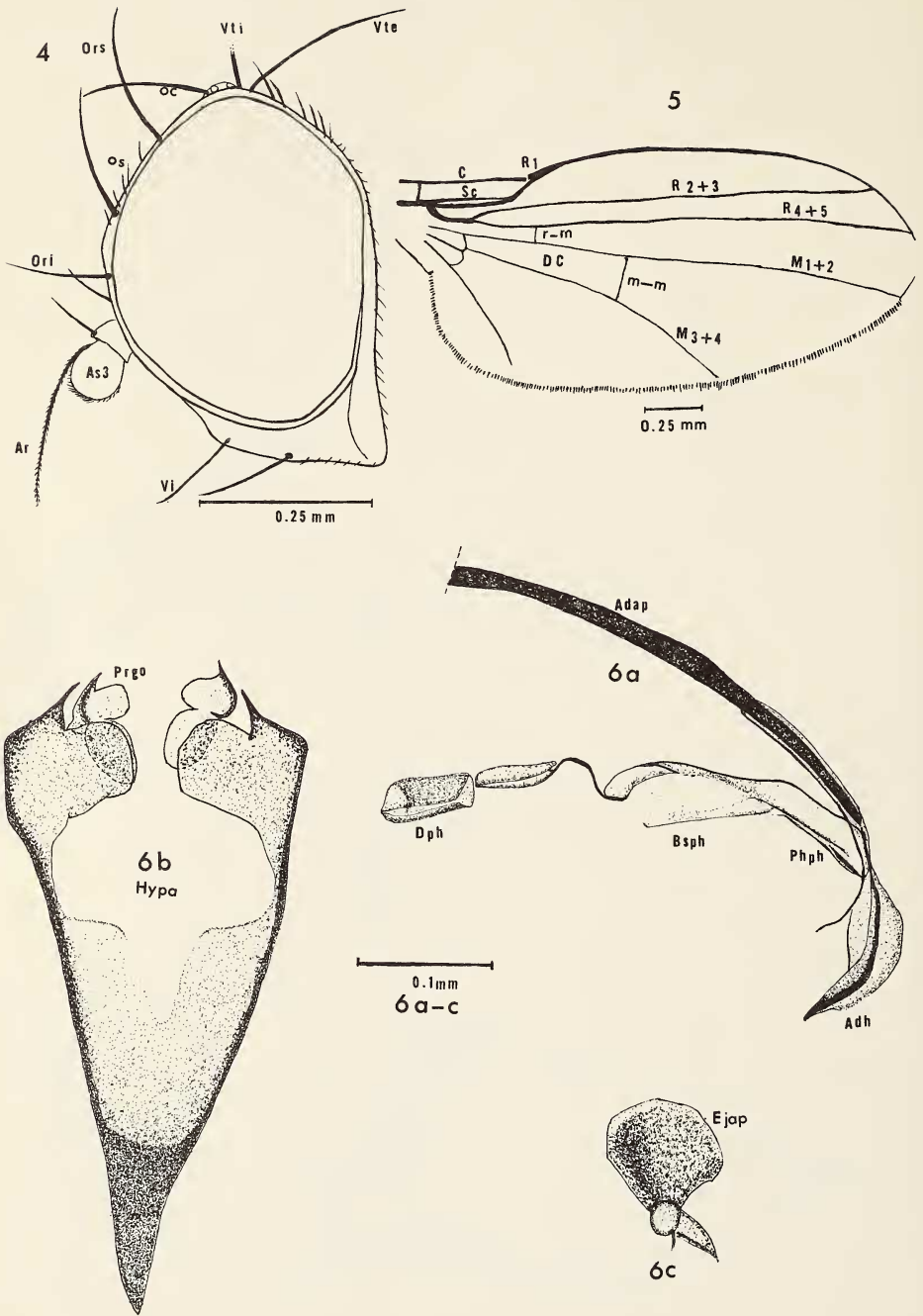
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ABBREVIATIONS

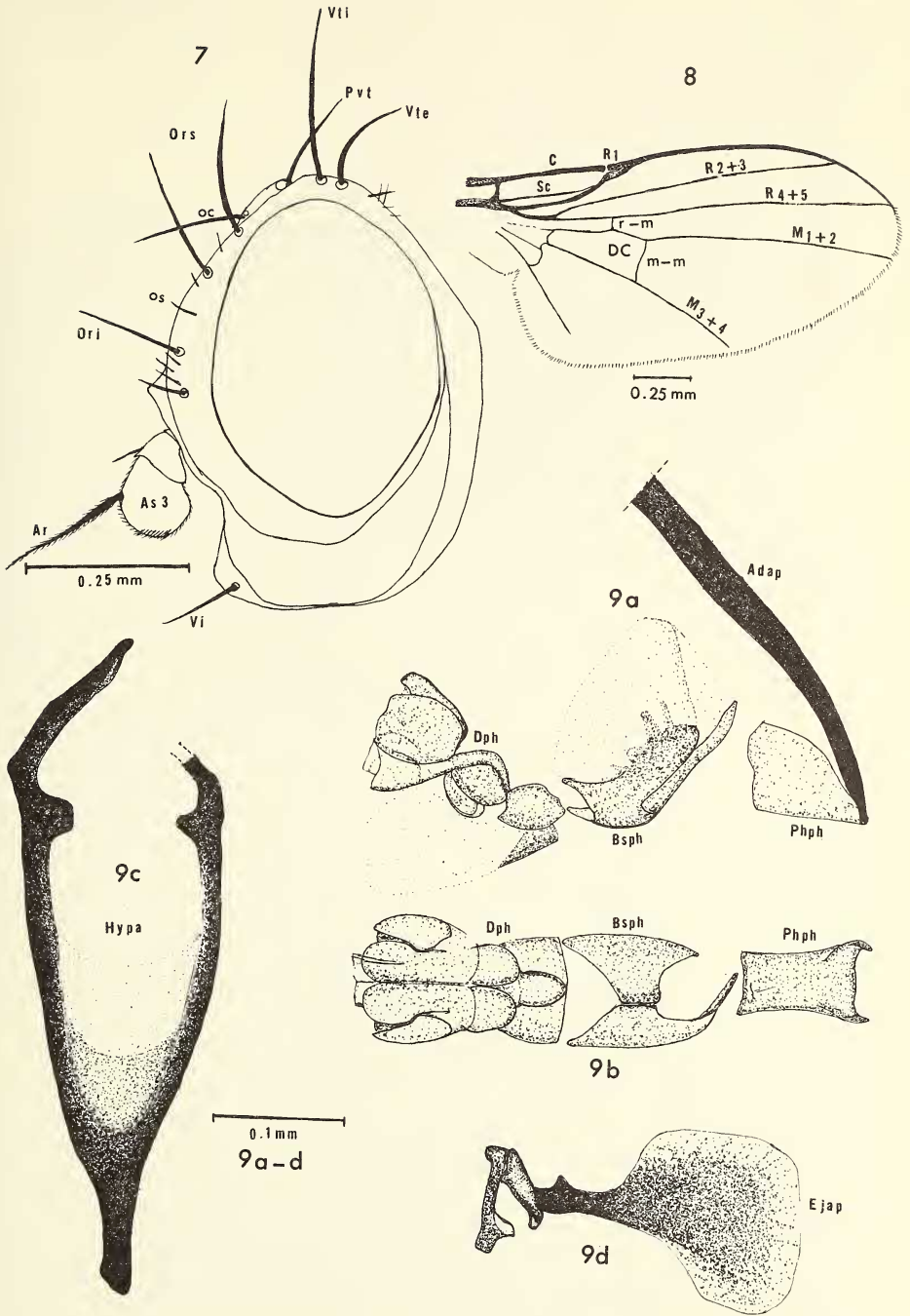
acr, acrostichal hair; Adap, aedeagal apodeme; Adh, aedeagal hood; Ar, arista; As3, third antennal segment; Bsph, basiphallus; C, costa; dc, dorsocentral bristles; DC, discal cell; Dph, distiphallus; Ejap, ejaculatory apodeme; Ejb, ejaculatory bulb; Ejd, ejaculatory duct; Epph, epiphallus; Hph, hypophallus; Hypa, hypandrium; m-m, medial cross vein; M_{1+2} and M_{3+4} median veins; Mph, mesophallus; oc, ocellar bristles; Ori, lower orbital bristles; Ors, upper orbital bristles; os, orbital setulae; Pgo, postgonites; Phph, phallophore; Prgo, pregonites; Pvt, postvertical bristle; R_1 , R_{2+3} & R_{4+5} , radial veins; r-m, radiomedial cross vein; Sc, subcostal vein; Vi, vibrissal hair; Vte, outer vertical bristle; Vti, inner vertical bristle.



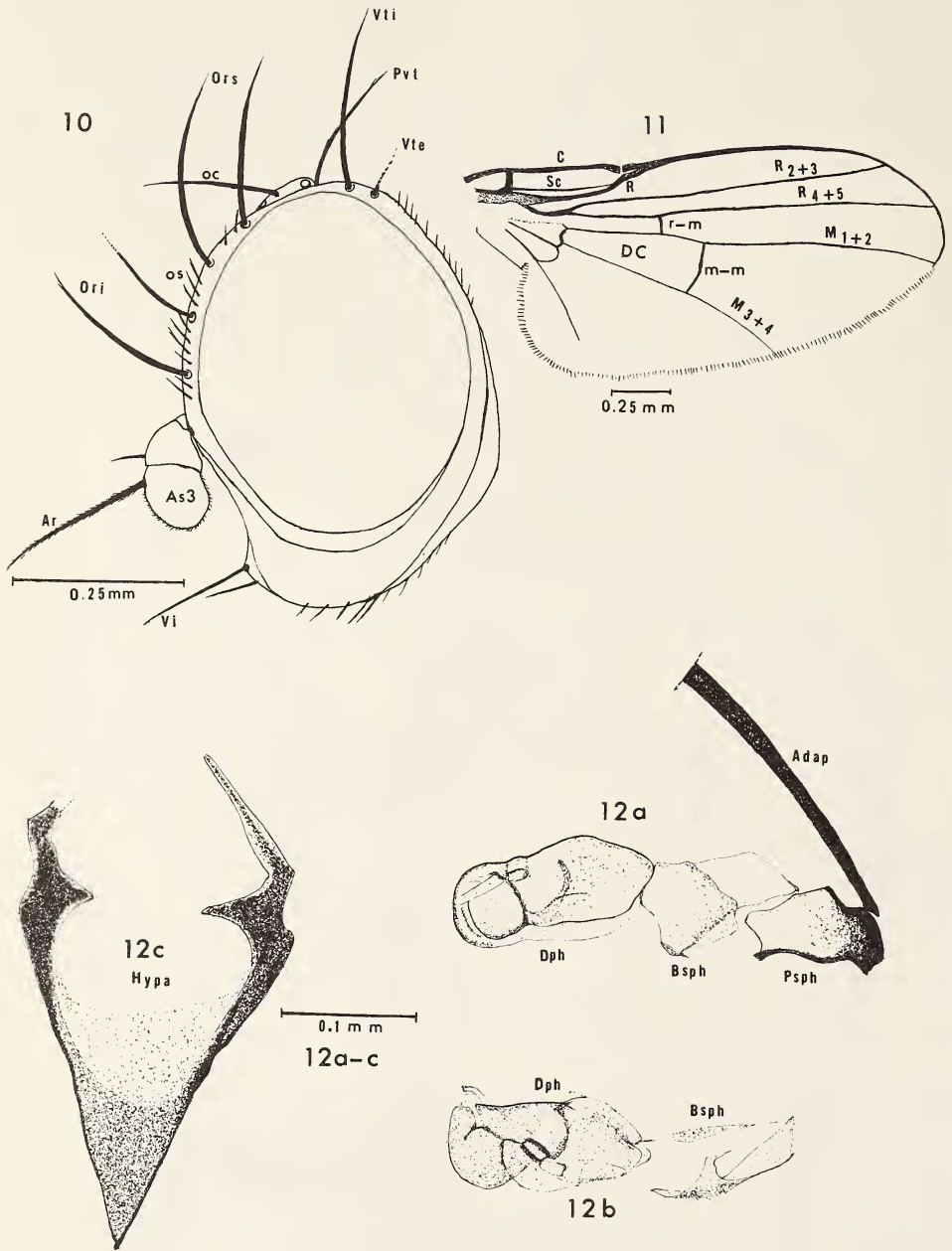
Figs. 1-3. *Agromyza albertensis* new species: 1 - head, lateral view; 2 - wing; 3a - aedeagus, lateral view; 3b - aedeagus, ventral view; 3c - hypandrium, ventral view; 3d - ejaculatory apodeme.



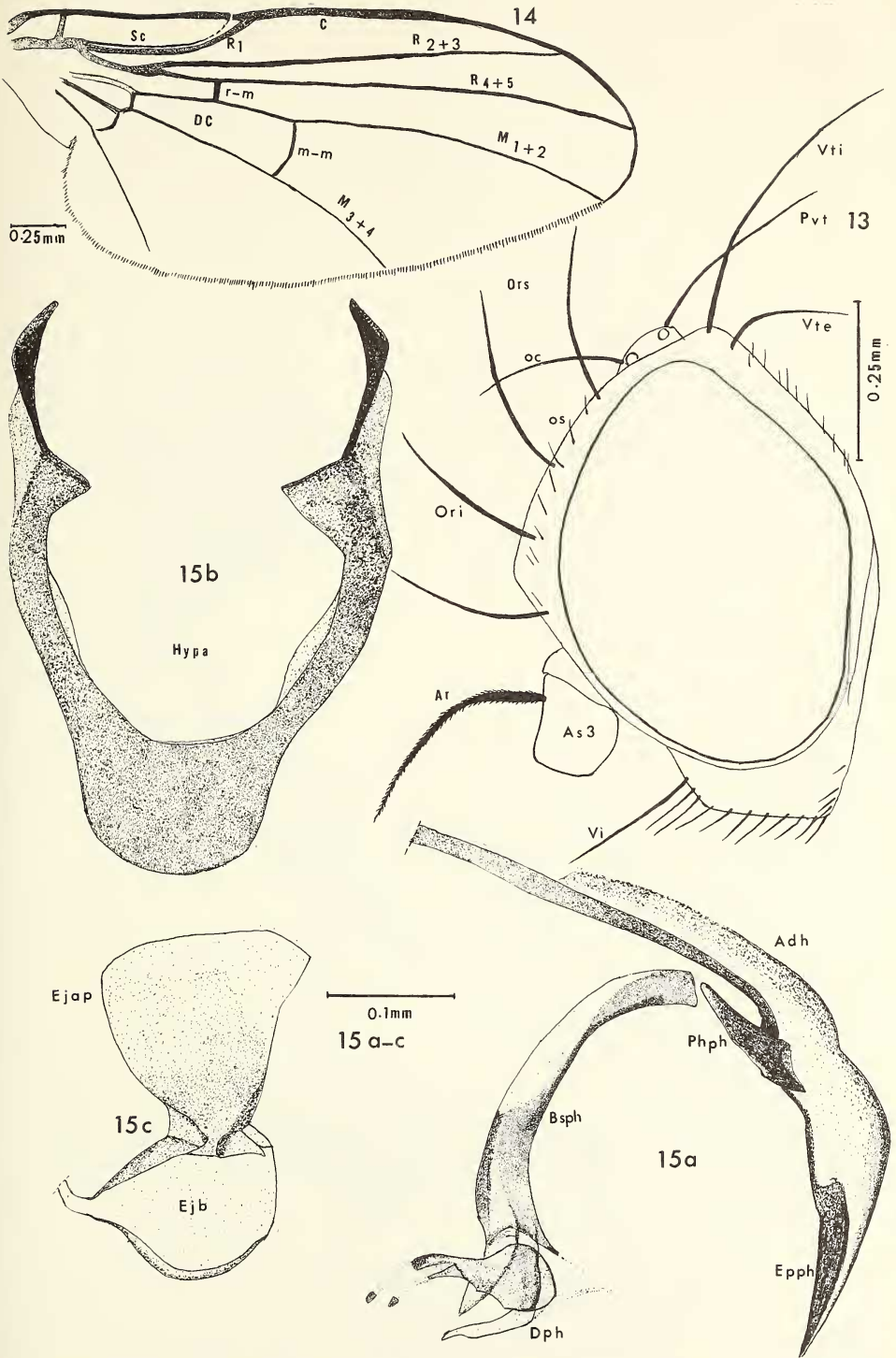
Figs. 4-6. *Agomyza masculina* new species: 4 - head, lateral view; 5 - wing; 6a - aedeagus, lateral view; 6b - hypandrium, ventral view; 6c - ejaculatory apodeme.



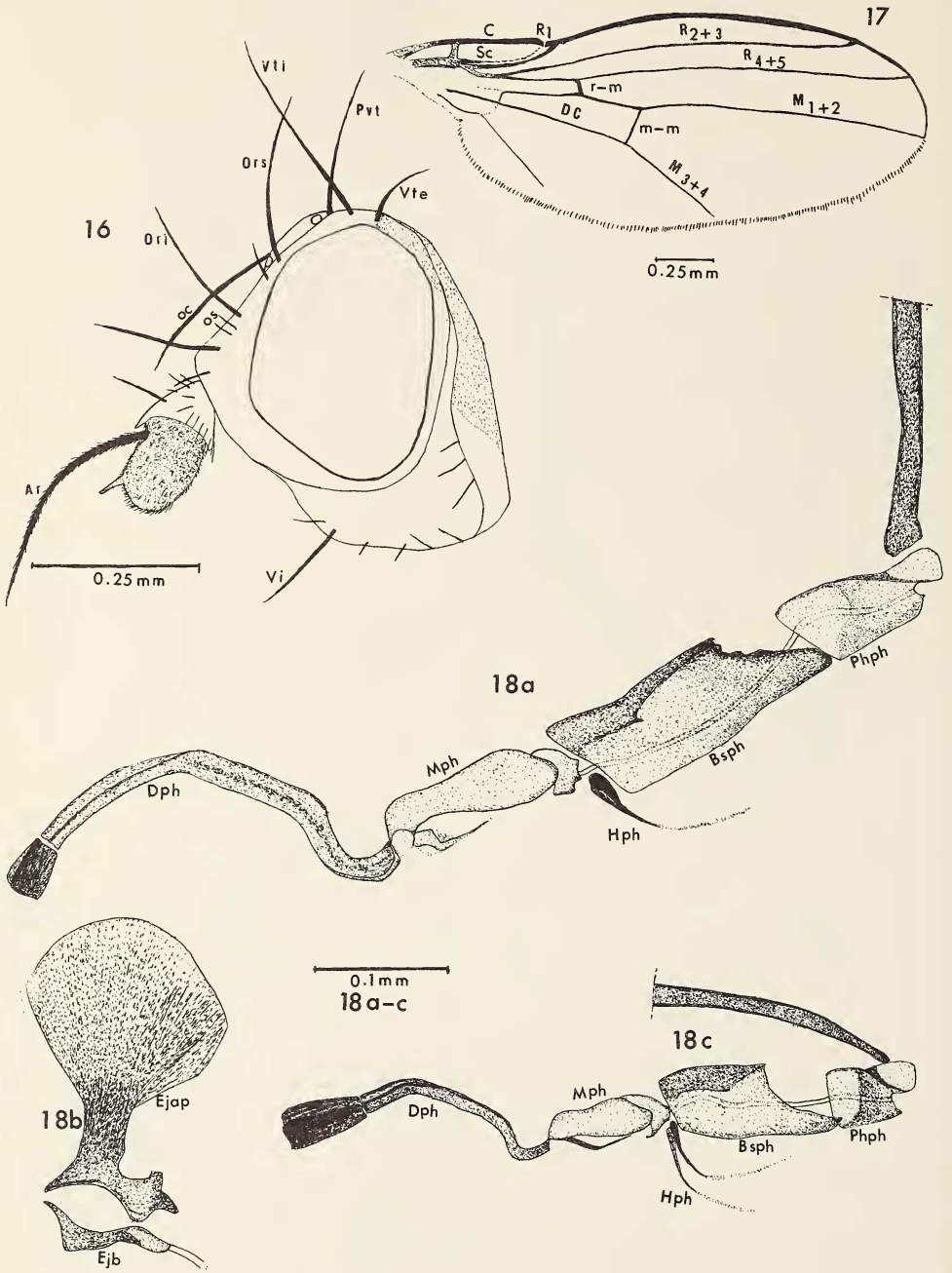
Figs. 7-9. *Ophimomyia monticola* new species: 7 - head, lateral view; 8 - wing; 9a - aedeagus, lateral view; 9b - aedeagus, ventral view; 9c - hypandrium, ventral view; 9d - ejaculatory apodeme.



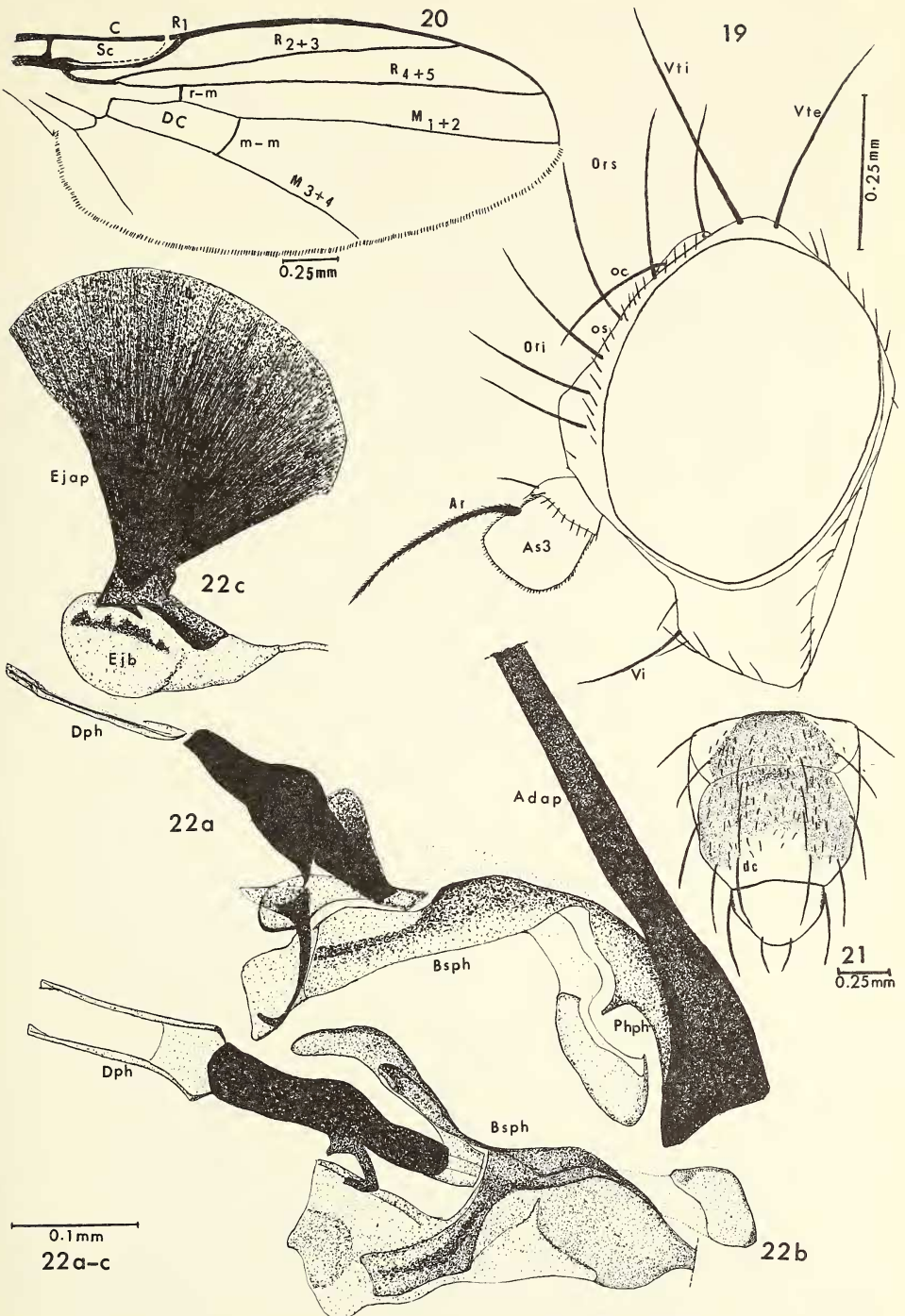
Figs. 10-12. *Ophiomyia pulicarioides* new species: 10 - head, lateral view; 11 - wing; 12a - aedeagus, lateral view; 12b - aedeagus, ventral view; 12c - hypandrium, ventral view.



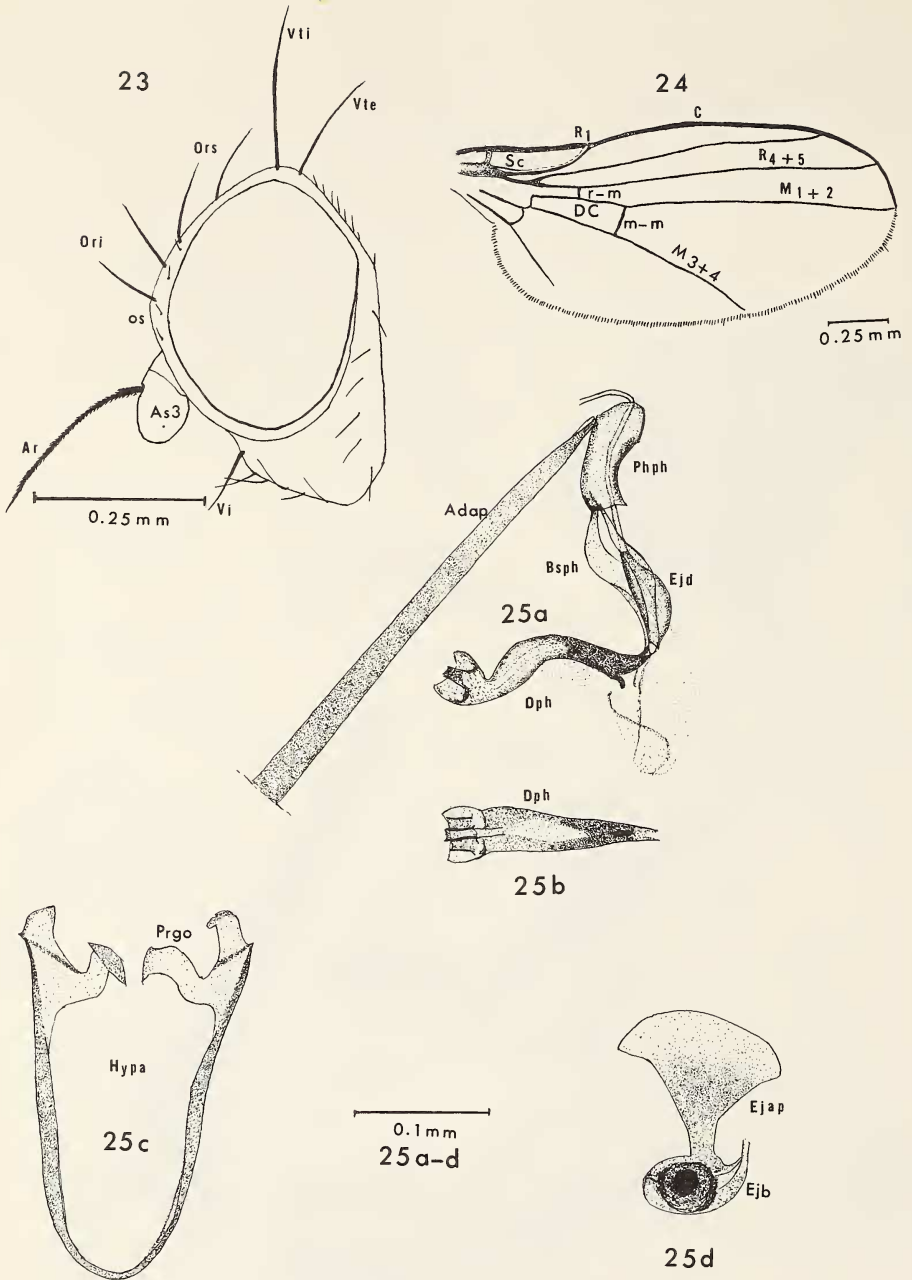
Figs. 13-15. *Phytobia flavohumeralis* new species: 13 - head, lateral view; 14 - wing; 15a - aedeagus, lateral view; 15b - hypandrium, ventral view; 15c - ejaculatory apodeme.



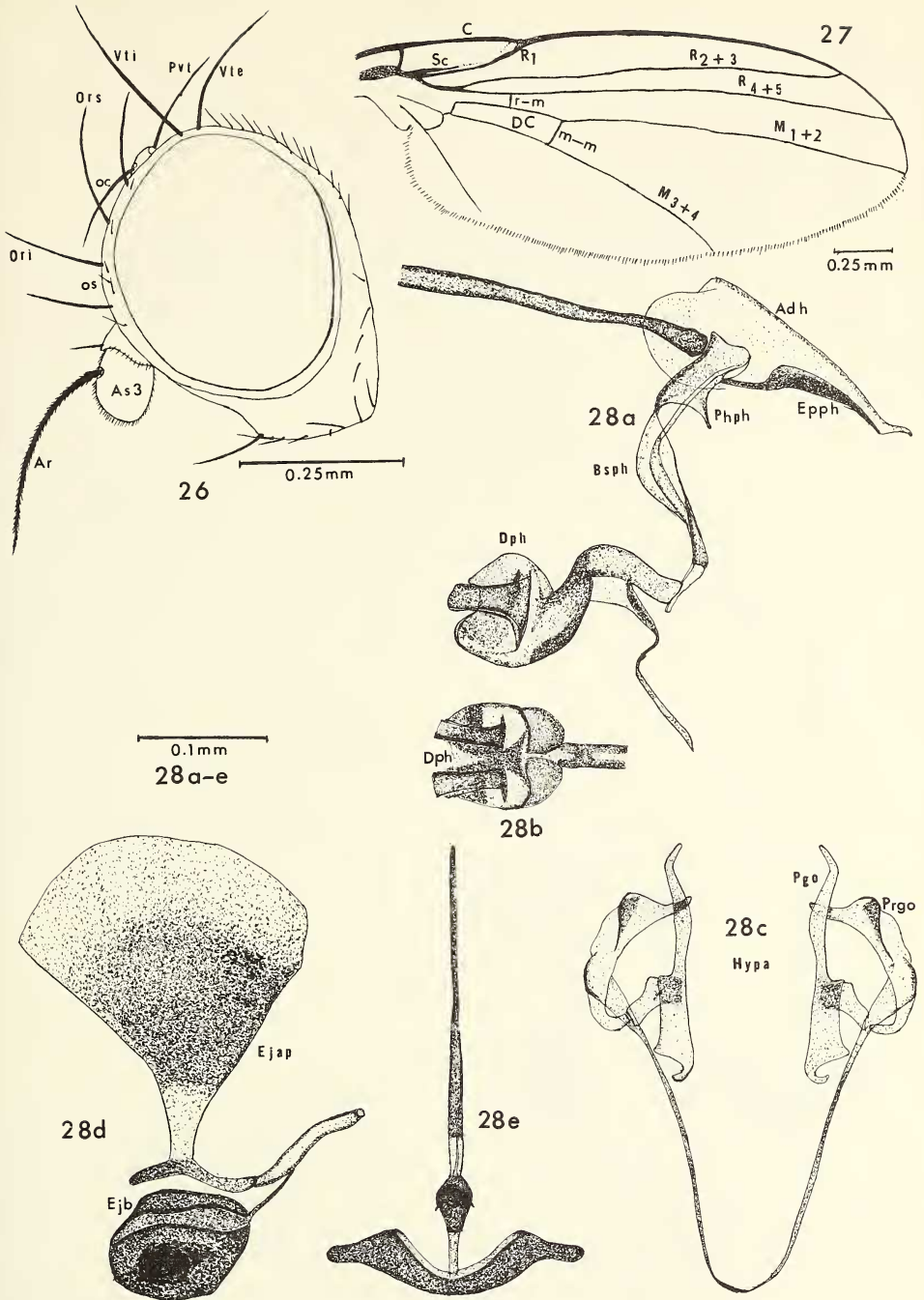
Figs. 16-18. *Cerodontha occidentalis* new species: 16 - head, lateral view; 17 - wing; 18a - aedeagus, lateral view; 18b - ejaculatory apodeme; 18c - *Cerodontha dorsalis* (Loew) - aedeagus, lateral view.



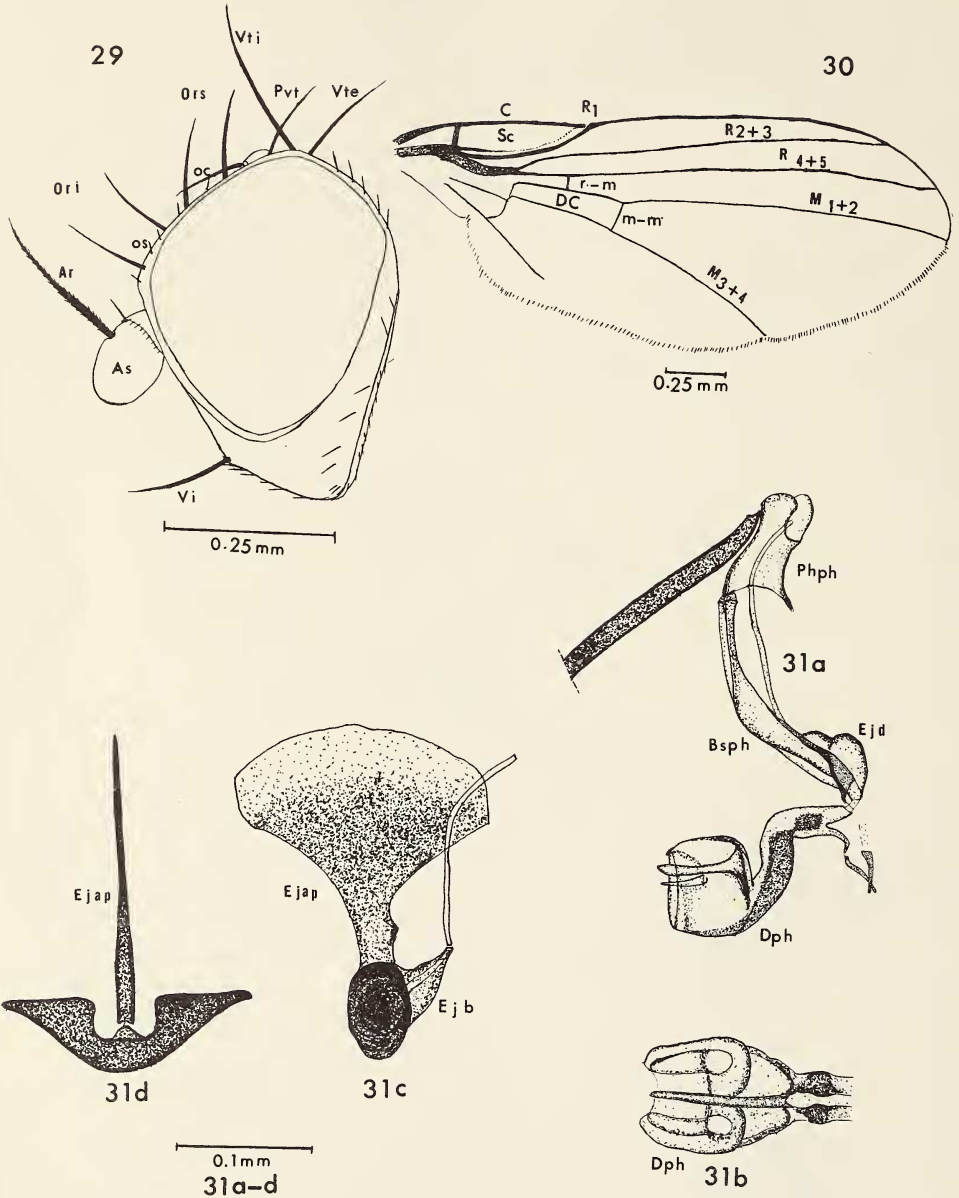
Figs. 19-22. *Liriomyza conspicua* new species: 19 - head, lateral view; 20 - wing; 21 - mesonotum, dorsal view; 22a - aedeagus, lateral view; 22b - aedeagus, ventral view; 22c - ejaculatory apodeme.



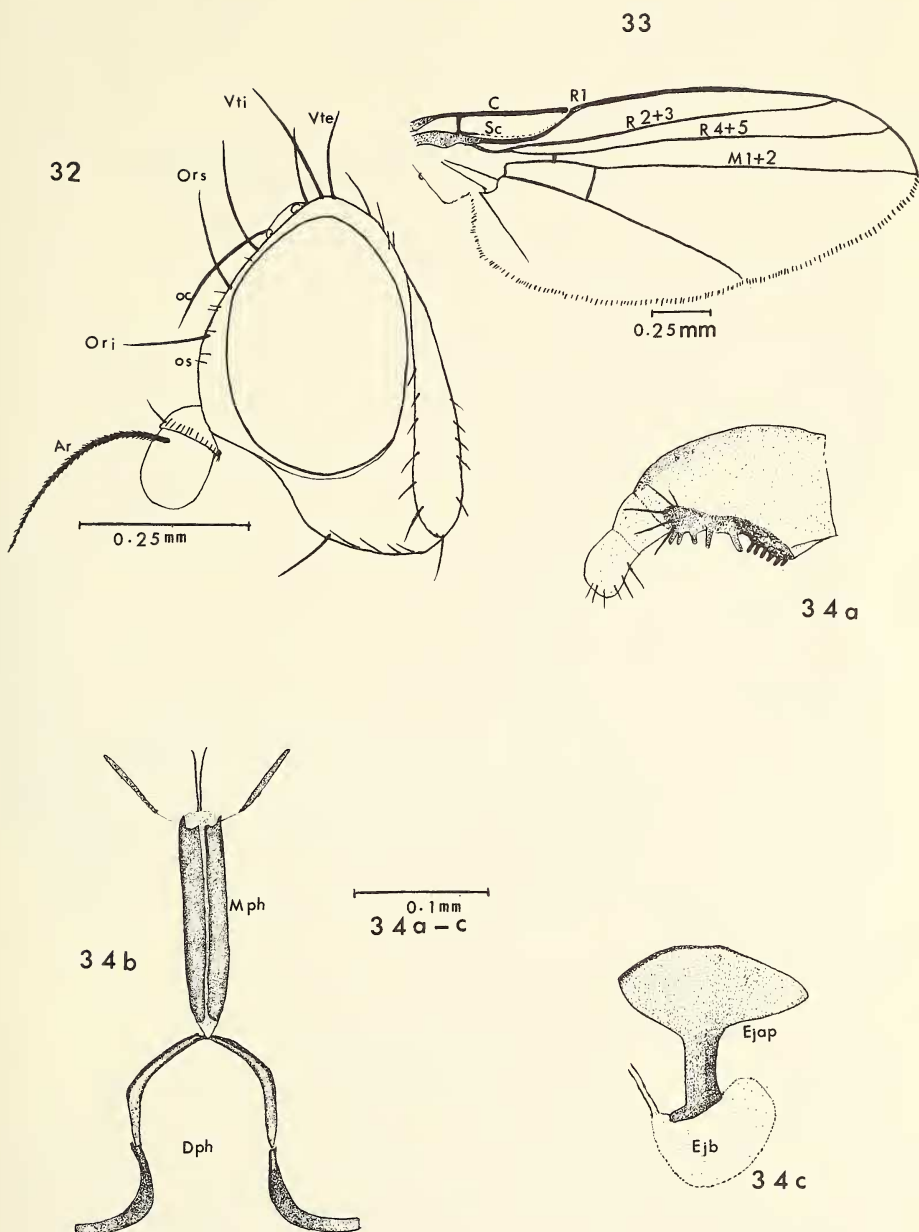
Figs. 23-25. *Liriomyza montana* new species: 23 - head, lateral view; 24 - wing; 25a - aedeagus, lateral view; 25b - distiphallus, ventral view; 25c - hypandrium, ventral view; 25d - ejaculatory apodeme.



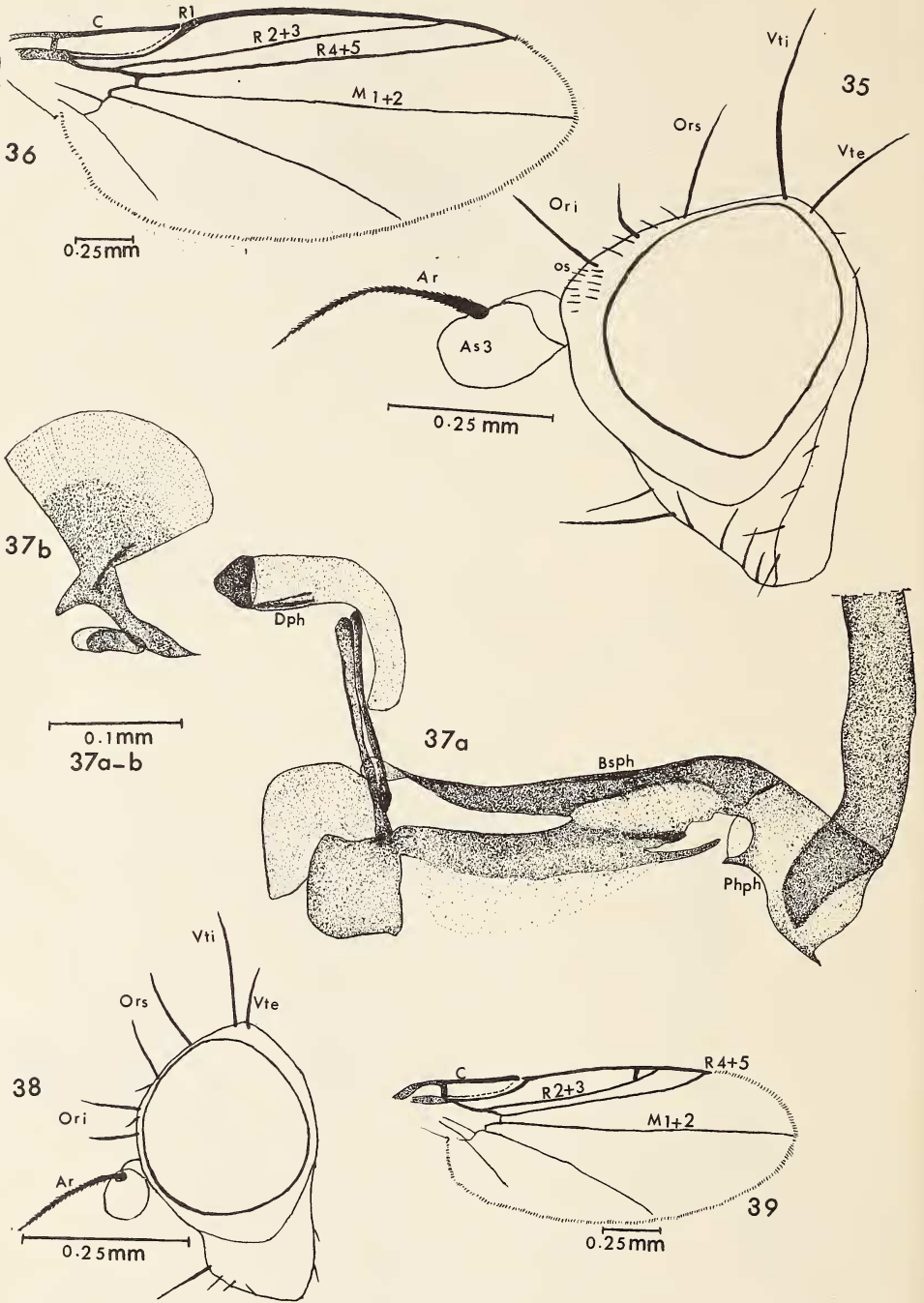
Figs. 26-28. *Liriomyza cordillerana* new species: 26 - head, lateral view; 27 - wing; 28a - aedeagus, lateral view; 28b - distiphallus, ventral view; 28c - hypandrium, ventral view; 28d - ejaculatory apodeme, front view; 28e - ejaculatory apodeme, side view.



Figs. 29-31. *Liriomyza septentrionalis* new species: 29 - head, lateral view; 30 - wing; 31a - aedeagus, lateral view; 31b - distiphallus, ventral view; 31c - ejaculatory apodeme, front view; 31d - ejaculatory apodeme, side view.



Figs. 32-34. *Lemurimyza pallida* new species: 32 - head, lateral view; 33 - wing; 34a - surstylus, ventral view; 34b - distiphallus, ventral view; 34c - ejaculatory apodeme.



Figs. 35-37. *Phytomyza lupini* new species: 35 - head, lateral view; 36 - wing; 37a - aedeagus, lateral view; 37b - ejaculatory apodeme. Figs. 38-39. *Phytomyza lupinivora* new species: 38 - head, lateral view; 39 - wing.